

The invention in which an exclusive right is claimed is defined by the following:

1. A method for compressing each file of a set of files, so that a total size of the files when thus compressed, does not exceed a predefined limit, comprising the steps of:

(a) determining a first compressed size of each file when compressed at a predetermined nominal compression level;

(b) determining a second compressed size of each file when compressed at a predetermined maximum acceptable compression;

(c) identifying files that should be compressed at the predetermined maximum acceptable compression as a function of the second compressed size for each file in the set;

(d) determining a specific desired compression level to apply to remaining files that are not to be compressed at the predetermined maximum acceptable compression, to enable all of the files in the set, when compressed, to have a total size no greater than the predefined limit; and

(e) compressing the files identified in step (d) at the predetermined maximum acceptable compression and the remaining files of the set at the specific desired compression level that was determined in step (e), producing compressed files having a total size no greater than the predefined limit.

2. The method of Claim 1, further comprising the step of determining a weight for each file in the set based upon a specific characteristic of data included in the files, wherein the step of identifying files that should be compressed at the predetermined maximum acceptable compression comprises the steps of:

(a) determining a scaling factor as a function of the predefined limit and a total of all of the weights;

(b) comparing the second compressed size with a product of the weight and the scaling factor; and

(c) identifying the files that should be compressed at the predetermined maximum acceptable compression as a result of the step of comparing.

3. The method of Claim 2, further comprising the step of subtracting a total size of all files identified to be compressed at the predetermined maximum acceptable compression from the predefined limit, to determine a remaining size for all other of the files in the set when compressed.

4. The method of Claim 2, further comprising the step of reiteratively carrying out steps (a) through (c) of Claim 2 in successive passes through the files in the set, until during a pass through the files, no file is newly identified to be compressed at the predetermined maximum acceptable compression.

5. The method of Claim 2, wherein the step of determining the specific desired compression level that should be applied to the files that are not to be compressed at the predetermined maximum acceptable compression comprises the step of determining an optimal compression level for each of the files that are not to be compressed at the predetermined maximum acceptable compression.

6. The method of Claim 5, wherein the optimal compression level for each file is determined by reiteratively adjusting a compression level of each file so that a resulting compressed size of the file does not exceed a desired file size for the file.

7. The method of Claim 6, wherein the desired file size for the file is a function of the weight of the file, and the sum of the weights.

8. The method of Claim 7, wherein unused space remaining from applying an optimal compression level to a previous file in the set is made available in determining the desired file size for a subsequent file of the set.

9. The method of Claim 8, wherein a compression level is iteratively modified for each of the files that are not to be compressed to the second compressed size, while reducing a range in which the compression level can be set, for each successive iteration.

10. The method of Claim 7, wherein a total unused space remaining from applying optimal compression levels to the files in the set is distributed among the files, by adjusting the optimal compression levels to employ less compression than the optimal compression level previously determined, for one or more files that are selected based upon a predefined criteria.

11. A memory medium on which are stored machine instructions for carrying out the steps of Claim 1.

12. A method for automatically selecting a quality level when compressing each of a set of image files to produce compressed image files, so that a total size of the compressed image file does not exceed a predefined limit, comprising the steps of:

(a) processing the image files to determine a maximally compressed file size for each image file when compressed to a predefined minimum quality level and to determine a nominal compressed file size when compressed to a nominal quality level, and to determine a weight for each image file based upon a high frequency energy content of the image file;

(b) identifying image files of the set that will be compressed with the predefined minimum quality level as a function of:

(i) the maximally compressed file size of each image file when compressed to the predefined minimum quality level; and

(ii) the weight of each image file;

(c) for all other image files of the set that were not identified to be compressed with the predefined minimum quality level in step (b), determining a quality level for compressing the other image files so that each of the other image files will be compressed to a desired size selected as a function of the weight of the image file and so that the total size of the compressed image files will not exceed the predefined limit; and

(d) compressing the image files identified in step (b) with the predefined minimum quality level, and all of the other image files not identified in step (b) with the quality level that was determined in step (c).

13. The method of Claim 12, further comprising the step of limiting the quality level that is used for compressing the image files to a predetermined range that extends from the predefined minimum quality level to a substantially higher predefined maximum quality level.

14. The method of Claim 12, further comprising the step of determining a scaling factor based upon a currently available space remaining for the compressed files within the predefined limit and a total of the weight of all of the other image files, wherein the step of identifying image files that will be compressed with the predefined minimum quality level is repeated in successive passes through the set of image files, until a pass through the set of image files is completed without identifying any additional image file to be compressed to the predefined minimum quality level.

15. The method of Claim 12, wherein the step of determining the quality level that will be used for compressing the other image files in step (c) comprises the steps of:

- (a) determining a desired size for the compressed image file for each of the other image files in the set that was not identified in step (b) of Claim 11, said desired size for the compressed image file being determined as a function of the weight of the image file;
- (b) determining an optimal quality level to apply to each of the other image files to achieve the desired size when the image file is compressed; and
- (c) determining a difference between the desired size and an actual size of the image file when it is compressed to the optimal quality level.

16. The method of Claim 15, wherein the step of determining the optimal quality level for each image file comprises the steps of:

(a) starting with the nominal quality level, determining if the nominal compressed file size is less than the desired size by no more than a predefined difference, and if so, assigning the nominal quality level as the optimal quality level; and if not,

(b) reducing a range from which to select a new quality level to try as the optimal quality level when compressing the image file, where the new quality level is determined using a model relating image quality to compressed file size;

(c) determining if the compressed file size resulting from compressing the image file using the new quality level is less than the desired size by no more than the predefined difference, and if so, assigning the new quality level as the optimal quality level; and if not,

(d) repeating the preceding two steps with successive new quality levels, until the optimal quality level is determined.

17. The method of Claim 12, wherein the predefined limit is selected based upon one of:

(a) a storage capacity of a storage medium on which the compressed image files are to be stored; and

(b) a maximum permissible size of an attachment to an email, wherein the attachment comprises the compressed image files.

18. A memory media on which are stored machine instructions for carrying out the steps of Claim 12.

19. A system for compressing each file of a set of files, so that a total size of the files when thus compressed, does not exceed a predefined limit, comprising:

(a) a memory in which are stored a plurality of machine instructions and the set of files;

(b) a processor that is coupled to the memory, said processor executing the machine instructions, to carry out a plurality of functions, including:

(i) determining a first compressed size of each file when compressed at a predetermined nominal compression level;

(ii) determining a second compressed size of each file when compressed at a predetermined maximum acceptable compression;

(iii) identifying files that should be compressed at the predetermined maximum acceptable compression as a function of the second compressed size for each file in the set;

(iv) determining a specific desired compression level to apply to remaining files that are not to be compressed at the predetermined maximum acceptable compression, to enable all of the files in the set, when compressed, to have a total size no greater than the predefined limit; and

(v) compressing the files identified to be compressed at the maximum acceptable compression and the remaining files at the specific desired compression level that was determined for the file, producing compressed files that have a total size no greater than the predefined limit.

20. The system of Claim 19, wherein the machine instructions further cause the processor to determine a weight for each file based upon a specific characteristic of data included in the file, and to identify the files that should be compressed at the predetermined maximum acceptable compression by:

(a) determining a scaling factor as a function of the predefined limit and a total of all of the weights;

(b) comparing the second compressed file size with a product of the weight and the scaling factor; and

(c) identifying the files that should be compressed at the predetermined maximum acceptable compression as a result of comparing.

21. The system of Claim 20, wherein the machine instructions further cause the processor to subtract a total size of all files identified to be compressed at the predetermined maximum acceptable compression from the predefined limit, to determine a remaining size for all other of the files in the set when compressed.

22. The system of Claim 20, wherein the machine instructions further cause the processor to reiteratively determine the scaling factor and compare the files in successive passes through the files in the set, until during a pass through the files, no file is newly identified to be compressed at the predetermined maximum acceptable compression.

23. The system of Claim 20, wherein the machine instructions further cause the processor to determine an optimal compression level for each of the files that are not to be compressed at the predetermined maximum acceptable compression.

24. The system of Claim 23, wherein the optimal compression level for each file is determined by reiteratively adjusting a compression level of each file so that a resulting compressed size of the file does not exceed a desired file size for the file.

25. The system of Claim 24, wherein the machine instructions cause the processor to determine the desired file size for the file as a function of the weight of the file, and the sum of the weights.

26. The system of Claim 25, wherein the machine instructions cause the processor to make available unused space remaining from applying an optimal compression level to a previous file in the set in determining the desired file size for a subsequent file of the set.

27. The system of Claim 26, wherein the machine instructions further cause the processor to iteratively modify a compression level for each of the files that are not to be compressed to the second compressed size, while reducing a range in which the compression can be set for each successive iteration.

28. The system of Claim 25, wherein the machine instructions cause the processor to distribute a total unused space remaining after applying the optimal compression levels to the files in the set among the files, by adjusting the optimal compression levels to employ less compression than the optimal compression level previously determined, for one or more files that are selected based upon a predefined criteria.

29. A system for automatically selecting a quality level when compressing each of a set of image files to produce compressed image files, so that a total size of the compressed image files does not exceed a predefined limit, comprising:

(a) a memory in which are stored a plurality of machine instructions, said memory also storing the set of image files;

(b) a processor that is coupled to the memory, said processor executing the plurality of machine instructions, causing the processor to:

(i) determine a maximally compressed file size for each image file when compressed to a predefined minimum quality level and determine a nominal compressed file size when compressed to a nominal quality level, and determine a weight for each image file based upon a high frequency energy content of the image file;

(ii) identify image files that will be compressed with a predefined minimum quality level as a function of:

(1) the maximally compressed file size of each image file when compressed to the predefined minimum quality level; and

(2) the weight of each image file;

(iii) for all other image files of the set that were not identified to be compressed with the predefined minimum quality level in subparagraph (ii), determining a quality level for compressing the other images files so that each of the other image files will be compressed to a desired size selected as a function of the weight of the image file and so that the total size of the compressed image files will not exceed the predefined limit; and

(iv) compressing the image files identified in subparagraph (ii) with the predefined minimum quality level, and compressing all the other image files not identified in subparagraph (ii) with the quality level that was determined in subparagraph (iii).



30. The system of Claim 29, wherein the machine instructions cause the processor to limit the quality level that is used for compressing the image files to a predetermined range that extends from the predefined minimum quality level to a substantially higher predefined maximum quality level.

31. The system of Claim 29, wherein the machine instructions cause the processor to determine a scaling factor based upon a currently available space remaining for the compressed files within the predefined limit and a total of the weight of all of the other image files, and to repeat the identification of image files that will be compressed with the predefined minimum quality level in successive passes through the set of image files, until a pass through the set of image files is completed without identifying any additional image file to be compressed to the predefined minimum quality level.

32. The system of Claim 29, wherein the machine instructions cause the processor to determine the quality level that will be used for compressing the other image files in subparagraph (iii) by:

- (a) determining a desired size of the compressed image file for each of the other image files in the set that was not identified in subparagraph (ii) of Claim 27, said desired size being determined as a function of the weight of the image file;
- (b) determining an optimal quality level to apply to each image file to achieve the desired size when the image file is compressed; and
- (c) determining a difference between the desired size and an actual size of the image file when it is compressed to the optimal quality level.

33. The system of Claim 32, wherein the machine instructions cause the processor to determine the optimal quality level for each image file by:

(a) starting with the nominal quality level, determining if the nominal compressed file size is less than the desired size by no more than a predefined difference, and if so, assigning the nominal quality level as the optimal quality level; and if not,

(b) reducing a range from which to select a new quality level to try as the optimal quality level when compressing the image file, where the new quality level is determined using a model relating image quality to compressed file size;

(c) determining if the compressed file size resulting from compressing the image file using the new quality level is less than the desired size by no more than the predefined difference, and if so, assigning the new quality level as the optimal quality level; and if not,

(d) repeating the preceding two steps with successive new quality levels, until the optimal quality level is determined.

34. The system of Claim 29, further comprising a storage medium on which the compressed image files are stored, wherein the machine instructions cause the processor to select the predefined size limit based upon one of:

(a) a storage capacity of the storage medium; and

(b) a maximum permissible size of an attachment to an email, wherein the attachment comprises the compressed image files.